44TH CONGRESS, 1st Session. SENATE. EX. DOC. No. 58.

LETTER

FROM

THE SECRETARY OF WAR,

COMMUNICATING

Information in relation to the encroachments of the sea upon the site of Fort Stevens, Oregon.

MAY 4, 1876.—Referred to the Committee on Military Affairs and ordered to be printed.

WAR DEPARTMENT, *May* 1, 1876.

The Secretary of War has the honor to transmit to the United States Senate, for the information of the Committee on Commerce, letter of the Chief of Engineers, report of the board of engineers for the Pacific coast, and accompanying papers and drawings, respecting the encroachments of the sea upon the site of Fort Stevens, mouth of the Columbia River, Oregon.

ALPHONSO TAFT,
Secretary of War.

OFFICE OF THE CHIEF OF ENGINEERS,
Washington, D. C., April 27, 1876.

SIR: Referring to my indorsement upon letter of Hon. J. H. Mitchell, of December 5, 1875, respecting the encroachments of the sea upon the site of Fort Stevens, mouth of the Columbia River, Oregon, I have the honor to inclose herewith a report of the board of engineers for the Pacific coast upon this matter, with accompanying papers and drawings, and to express my concurrence in the views expressed therein.

It is suggested that the papers be sent to the Committee on Commerce of the Senate.

Very respectfully, your obedient servant,

A. A. HUMPHREYS,
Brigadier-General, Chief of Engineers.

Hon. ALPHONSO TAFT,
Secretary of War.

BOARD OF ENGINEERS, PACIFIC COAST,
San Francisco, Cal., March 15, 1876.

GENERAL: Referring to my letter of February 25, 1876, I have now the honor to inclose herewith to the Department a copy of a letter

from Maj. John M. Wilson, of the Corps of Engineers, of February 8, 1876, relating to the erosion of the shore at Point Adams. The three drawings to which Major Wilson refers are also inclosed for the information of the Department.

As the board of engineers out here is of opinion that the erosion of the main shore around Point Adams is in some way connected with the currents between the main-land and Clatsop Spit, through the swash-channel, I have directed Major Wilson to have a survey made of this channel, including the outline of the spit, with the view that we may be able to ascertain the cost of closing, or partially closing, this swash-channel. I may as well add that I have ordered Major Wilson, when this survey shall have been completed, (if his other duties will permit,) to come to this city and consult with the board as to the best method of stopping the erosion above mentioned.

The subject will then be brought before the board again, and probably a final report can be agreed on.

Very respectfully, your obedient servant,

B. S. ALEXANDER,
Lt. Col. Engineers, President Board of Engineers for the Pacific Coast.

Brig. Gen. A. A. HUMPHREYS,
Chief of Engineers U. S. A., Washington, D. C.

UNITED STATES ENGINEER'S OFFICE,
Portland, Oreg., February 8, 1876.

COLONEL: In accordance with your letter of November 30, 1875, to my predecessor, Major Michler, I have the honor to transmit herewith charts recently prepared under my direction, as follows:

No. 1. Showing the present shore-line at Point Adams, the mean of lowest low water, and the one and two fathom curves; inside the shore-line, the broken black line represents the outline of level ground lately covered with drift-wood thrown up by heavy seas. The red lines at right angles to the shore represent the lines upon which cross-sections were taken; the figures on the red contour-lines indicate the height above highest water; the mean of lowest low water is $1\frac{3}{10}$ feet above the lowest water ever known, and the difference of level between the lowest and highest water is about twelve feet.

No. 2. Shows the cross-sections, 80 feet in shore and 720 feet outside.

No. 3. Shows the shore-lines of Point Adams, as surveyed at various times from 1868 to 1876.

I have personally visited and inspected this locality, and, from information obtained from Capt. M. P. Miller, Fourth United States Artillery, commanding the post, who has for two years watched the erosion, and from my own examination, I have to report as follows:

The flood-tide, advancing through a channel narrow and shallow at low water, but wide and swift at high, coming from the west, strikes the shore about three-quarters of a mile south of the point, and then, changing direction, sweeps northward along the shore until off the point it meets the flood in the middle channel; this meeting of the tides forms breakers, which roll up against the point of the reserve, running east along the river shore and a little south of the west shore, doing great execution, while the flood-tide, of its own action through the first channel mentioned, is also washing away the shore.

With the erosion of Point Adams, Clatsop Spit, due west, appears to

be moving in the same direction. I have been informed that at lowest low water one could walk from the westerly beach to the spit. I saw that this channel was quite narrow at low water, and am inclined to think that only the action of the flood-tides keeps it open. Had I known this before I ordered the survey, I should have included this channel and the spit, and have carefully observed the currents.

Point Adams is a sand-spit consisting of ridges of sandy soil and swamps. I carefully examined the shore where the erosion was in progress and found no clay. At high water immense trees act as battering-rams and aid the ocean in the destruction. The beach is covered with drift-wood near high-water mark, which one would think would constitute a good revetment in itself. Numbers of these immense logs are found near the northern extremity of the point, indicating something of an eddy when the tides meet.

The swamps back of the shore-line are filled with water during the rainy season, emptying over the beach on the west side and facilitating the erosion. During the summer these are nearly all dry. The greater part of the damage, I am informed, occurs in the fall and winter, but little going on during the summer-months.

It is with some hesitation that I present an opinion to the board as to the best method of stopping this erosion, as I am not yet entirely familiar with the action of the tides and currents on this coast.

It would appear that a change of direction of the current coming through the channel between Clatsop Spit and the main shore, by a pier running out toward the spit, across that portion which is reported as so shoal at low tide, might prevent the flood-tide running up this direction, and thus stop the eddy formed by the meeting of the tides through the two channels off the north of the point. But it is to be feared that, while success might attend this as far as the shore is concerned, the change might cause the erosion of the south face of Clatsop Spit, and throw the materials thus washed off into the narrow channel over the bar.

Again, it is possible that a series of short pile-piers, running out at right angles to the shore, might break the force of the sea, and by causing the sand to be deposited between them eventually increase the point to the area it covered a few years since.

To drive a continuous line of piles around the whole shore and cap them would be an expensive piece of work, but would probably produce the desired result.

In case the board should wish to prepare an estimate of cost, the following schedule of prices here is respectfully submitted:

Rubble-stone, about $12 per cord.
Piles, 12″ to 20″ diameter, 6 cents per linear foot.
Sawed timber, $12 per 1,000 feet, board-measure.
Iron, 4¼ cents per pound.
Driving piles, $2 each.
The prices are in coin.

The chart of Point Adams transmitted to me is returned herewith.

I am, sir, very respectfully, your obedient servant,

JOHN M. WILSON,
Major Engineers, U. S. A.

Lieut. Col. B. S. ALEXANDER,
President Board of Engineers, Pacific Coast.

A true copy.

B. S. ALEXANDER,
Lieutenant-Colonel Engineers.

UNITED STATES ENGINEER OFFICE,
Portland, Oreg., March 22, 1876.

SIR: In accordance with the resolution of February 24, 1876, of the board of engineers of the Pacific Coast, I have the honor to transmit herewith a chart showing Point Adams, Clatsop Spit, and the narrow channel between the two. It will be observed from the data given on the chart that this channel flows in different directions during the first and last portions of the ebb-tide, and that a great portion of the damage arises from the eddy formed by the ebb when it strikes near the locality marked "D" on Clatsop Spit.

In my report of February 8, I attributed most of the damage to the meeting of the flood-tides in this vicinity. At that time I had no accurate survey of the channel, and based my conclusions on such information as I was able to obtain from those who were supposed to be the best informed on the subject.

The present survey shows that the greatest amount of damage is done during the ebb, but a portion is nevertheless the result of the direct attack of the flood, and considerable execution is done by the violence of the advancing seas, after from two to three hours' flood, and particularly during a gale. As these heavy seas roll directly over Clatsop Spit, no protection could be afforded other than by a revetment around that portion of the reservation attacked.

An examination of the chart will show that the channel between Clatsop Spit and the shore, as located on the Coast Survey chart from their examination in 1868, is now closed during the first quarter, perhaps third, of the flood, and last quarter or third of the ebb. I am also informed that less than a year ago a boat was rowed from what is now the lower end of the swash-channel, across Clatsop Spit to the vicinity of the wreck, at low water. Whether it was an average low water or not I could not learn; but this seems to indicate that the spit is rapidly increasing, and the comparison with the Coast Survey chart mentioned, the only former survey of the spit that I can obtain, shows a most decided change in the swash-channel.

With these facts before me, in answer to the second paragraph of the resolutions of the board, as to the efficacy of partially closing this channel by a low wall of riprap stone and brush raised to half-tide, I have to state that the survey now shows the lower end to be partially closed, and that Clatsop Spit is rapidly making. While hesitating to differ with the distinguished officers of the board, I must say that I doubt the propriety of building any structure at present, and would prefer waiting a short time to see whether the erosion will not be controlled by the action of the currents themselves.

If, however, the board desire a structure built to control and direct the flow of the ebb, and to prevent the eddy at D, and consequent damage, then a breakwater might answer their wishes, running from the shore opposite to the north salient of Fort Stevens toward the point marked "D" on Clatsop Spit; but, to be of benefit, I think it should be built to the level of ordinary high water, as much damage is done during the first half of the ebb. As this structure would probably be of a temporary character and produce the desired results as far as the eddy from the ebb and from the meeting of the floods is concerned, in a reasonable period, it could be made of brush and large stone. The latter can be obtained at Cementville, opposite Astoria, at a cost of about $10 per cord (coin) delivered. I have within a few days carefully examined Tongue Point, where it is proposed to locate the buoy-depot for the 13th

light-house district, and I found there a large amount of stone fit for use in the proposed breakwater.

The depth at high water on the line indicated varies from zero to 16 feet; the length of the breakwater would be about 3,000 feet, and the amount of stone required about 2,500 cords.

A dike of the character mentioned could be built for about $12 per foot in currency, or $36,000 for the work.

This will stop the flow and action of the ebb, but the result of the direct blow of the flood will be felt to a certain extent until Clatsop Spit is high enough to prevent it.

I am, general, very respectfully, your obedient servant,

JOHN M. WILSON,
Major Engineers, U. S. A.

Lieut. Col. B. S. ALEXANDER,
Brevet Brigadier-General, U. S. A.,
President Board of Engineers, San Francisco, Cal.

A true copy.

JNO. H. WEEDEN,
First Lieutenant Engineers, U. S. A., Recorder.

BOARD OF ENGINEERS FOR THE PACIFIC COAST,
San Francisco, Cal., April 4, 1876.

GENERAL: I have the honor to inclose herewith to the Department the report of the board of engineers for the Pacific coast in reference to the erosion of the shore at Point Adams, Oreg., called for by Department letter of November 19, 1875.

Very respectfully, your obedient servant,

B. S. ALEXANDER,
Lieut. Col. Engineers, Brevet Brig. Gen., U. S. A.,
President of Board.

Brig. Gen. A. A. HUMPHREYS,
Chief of Engineers, U. S. A., Washington, D. C.

BOARD OF ENGINEERS FOR THE PACIFIC COAST,
San Francisco, Cal., April 4, 1876.

GENERAL: The board of engineers for the Pacific coast has carefully considered the subject of preserving the site of Fort Stevens, Oreg., from further erosion by the sea, to which its attention was directed by the letter of the Department of November 19, 1875, and it now has the honor to submit the following report.

When its attention was first directed to this subject, the board had not in its possession the detailed topographical information necessary for planning any work for the protection of Point Adams. Accordingly, on the 30th of November, 1875, the board requested Major Michler, of the Corps of Engineers, then in charge of engineer operations in that locality, to have a new survey of the shore around Fort Stevens made, giving also the profiles of the same at various points from 200 feet inside of the high-water mark out to the line of 6 feet of water below low tide.

When Major Michler was relieved from duty at Portland, this request

of the board to him was turned over to his successor, Maj. J. M. Wilson, of the Corps of Engineers.

Major Wilson promptly complied with the request of the board, and forwarded the map of the survey asked for, with a letter to the president of this board, on the 8th of February, 1876, both of which were transmitted to the Department on February 25, 1876, with a letter from the president of the board.

The Chief of Engineers is therefore fully informed of the steps taken by this board in the consideration of this subject up to that time.

On returning to this question again, with Major Wilson's survey and letter before it, the board was of the opinion that the erosion of the shore around Point Adams was probably due to the proximity of the swash channel between Clatsop Spit and that shore; accordingly the board—

Resolved, That the president of the board be instructed to ask Major Wilson to make a survey of the narrow channel between Clatsop Spit and the adjacent shore, giving particularly the position and depth of the lines of shoalest water, where a spur-dike (if any should be built) ought to be placed, and also the position of low water around Clatsop Spit.

Resolved further, That Major Wilson be requested to give to this board his opinion as to the efficacy of partially closing this channel by a low wall of riprap stone and brush, or of stone alone, rising to half-tide, or, if he prefer any other method of construction, to give such in addition, with an estimate of the cost of each.

The board now has this new survey of Major Wilson before it, together with his letter of explanation accompanying it, dated March 22, 1876, copies of both of which are herewith inclosed.

There is also inclosed a tracing of that portion of a "hydrographic survey from the bar to Tongue Point, Columbia River, Oregon, by Edward Cordell, assistant U. S. C. S., 1868," in the vicinity of Fort Stevens, enlarged to the same scale as the map of Major Wilson.

By superimposing one of these tracings on the other, it will be seen that great changes have taken place in the position and size of Clatsop Spit, and also of the swash-channel between it and the main shore.

The western shore of Point Adams has receded, by erosion, a maximum distance of 1,700 feet, while the eastern line of Clatsop Spit, opposite to this place, has moved toward the main-land about 2,800 feet, reducing the width of the swash-channel as follows:

	A. D. 1868.	A. D. 1876.
Between the low-water lines, from about.....	1,440 feet	to 420 feet.
Between the 6-foot curves, from about	1,000 feet	to 330 feet.
Between the 12-foot curves, from about.....	780 feet	to 150 feet.

The center of figure of Clatsop Spit has moved eastward nearly 3,000 feet.

In 1868 there was a channel 15 feet deep between the main-land and the southern end of that portion of Clatsop Spit, which was then bare at low water. This channel is now entirely closed until after the first quarter, perhaps third, of the flood-tide. (*Vide* Major Wilson's letter, herewith.)

In 1868 the maximum width of Clatsop Spit, bare at low water, was about 3,000 feet, as against about 4,200 feet in 1876. In addition, there is now near the northern extremity of the Spit an area of some 2,100 feet east and west, by 700 feet north and south, which is covered at spring-tides only.

It must be admitted that the erosion of Point Adams during the past eight years has been so great that a continuation of the same action for a few more years would seriously endanger the actual site of Fort Ste-

vens, yet the great changes that have taken place in the position, depth, and width of the swash-channel, and in the position and height of Clatsop Spit, point to a time not distant when this spit will be joined on to the main-land and the swash-channel be obliterated by natural causes. If this happens, the erosion of the shore of the main-land will probably cease, and a better site for Fort Stevens be found several thousand feet to the westward.

For this reason, and the additional one that the changes constantly going on would, before an appropriation for its execution could be obtained, probably vitiate any plan of improvement which might be suggested at this time, the board does not think it necessary to submit at present any project for arresting the erosion of Point Adams.

The board, however, recommends that an appropriation of $40,000 be asked for as a precautionary measure, so that if at any time the site of Fort Stevens be in great danger, the means for its preservation may be at hand. If this danger should never occur, the money would, of course, revert to the Treasury.

In addition, the board would recommend that in the future semi-annual surveys of the swash-channel, of Clatsop Spit, and of the shore-line of Point Adams be made, one at the close of the summer, the other at the close of the winter season.

Respectfully submitted.

G. H. MENDELL,
Bvt. Col., U. S. A., Major of Engineers.
R. S. WILLIAMSON,
Lt. Col. United States Engineers.
C. SEAFORTH STEWART,
Lt. Col. Engineers.
B. S. ALEXANDER,
Lt. Col. Engineers, Bvt. Brig. Gen., U. S. A.,
President of Board.
JNO. H. WEEDEN,
First Lieut. Engineers, U. S. A., Recorder.

Brig. Gen. A. A. HUMPHREYS,
Chief of Engineers, U. S. A., Washington, D. C.

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